

Paula Scheffman Earns Top Secretary Award

Paula N. Scheffman, secretary to ERPO Operations Planning and Requirements Office manager Olav Smistad, has been selected JSC Outstanding Secretary for June.



Smistad, in nominating Scheffman for the award, wrote that she "worked many long extra hours to become familiar with new surroundings and terminology" when ERPO was formed in 1972.

"Her initiative in becoming familiar with multi-program ERPO projects and key personnel greatly assists project managers ... She has a strong sense of loyalty to NASA, JSC and the Earth Resources program. As an example, she voluntarily provided secretarial and administrative support to scientists and technicians to the Mexican Outer Space Commission during the international remote sensing training program at JSC ...

"She sets high standards for her-

self and has continually taken advantage of opportunities to increase her skills and effectiveness. She recently completed the Certified Professional Secretary examination review course, a shorthand excellence course, and a secretarial professional development workshop ... Her intelligence, initiative, spirit of cooperation, excellence in skills, strong sense of dedication and unusual willingness to help others has won her the respect of fellow workers as well as that of persons outside NASA."

NASA Plane Photographs Beach Trash

A Wallops Center-based NASA C-54 aircraft has photographed several Long Island beaches recently polluted by waterborne trash.

Carrying two T-11 aerial cameras — one for natural color and one for near-infrared — the surveillance flight was requested June 22 by W. Labrizzi, Chief of the Environmental Protection Agency (EPA) Region II's Surveillance and Analysis Division, Edison, N.J., and photographic flights were made the following day.

Films were developed June 24 at NASA's Wallops Flight Center, Wallops Island, Va., and delivered to Labrizzi the next day.

Science Team Studies Unmanned Lunar Flight

A team of distinguished scientists has been selected by NASA to study and develop experiments for a proposed unmanned lunar mission in 1980.

The Moon flight, under study at NASA's Jet Propulsion Laboratory, Pasadena, Calif., would be the first US lunar mission since Apollo 17 in 1972.

It would be carried out with a low-cost, instrumented polar-orbiting spacecraft and a smaller companion subsatellite launched together from Cape Canaveral by a single Delta launch vehicle.

The spacecraft would orbit the Moon for a year, examining nearly all of the lunar surface with a battery of scientific instruments. From the measurements, scientists would be able to measure the Moon's gravity, magnetism, and heat flow, and to determine the chemical and mineral composition of the Moon's surface.

By surveying the Moon from pole to pole on both near and far sides, the mission would expand the knowledge obtained from the small areas, visited by previous US and Soviet missions, to the whole of the Moon. The mission would be, in fact, the first global survey of a body other than the Earth. Some of the questions scientists hope to answer include the following:

Did the Earth and Moon form from a common "reservoir" of original material?

Does the Moon have an iron-rich core like the Earth? If so, when did it form? How did its formation

affect the Moon? If not, what is the source of the magnetism found in the lunar rocks?

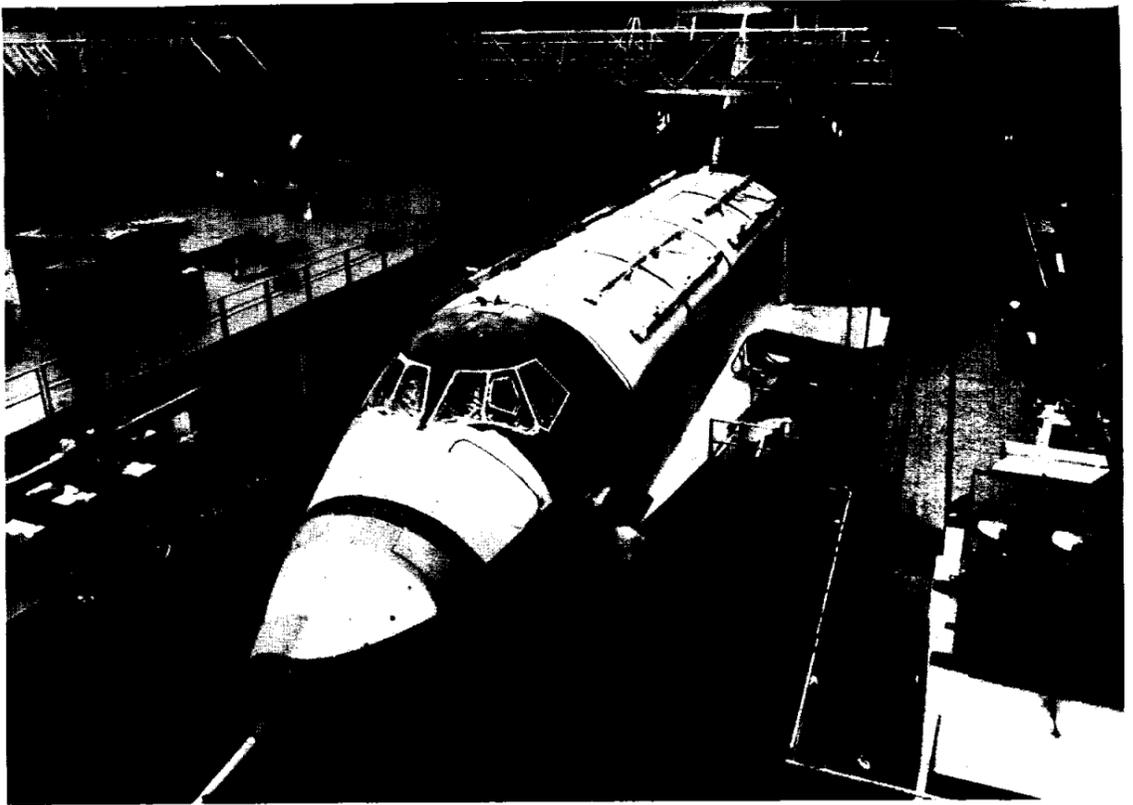
Is there evidence for large-scale movements of material in the Moon's interior similar to those which exist in the Earth today?

What was the nature of the intense meteorite bombardment which altered the surface of the Moon early in its history?

(Continued on page 3)



THE DIRECTOR'S NEW CLOTHES — JSC Director Christopher C. Kraft, Jr. is assisted into a developmental Space Shuttle pressure garment by Al Rochford of Crew Systems Division. The JSC-developed Shuttle spacesuit is a two-piece modular design with separate upper and lower torso sections joined by a waist body seal closure instead of the historical slide fastener. The life support system is integral with the upper torso. Adjustable-fit suit segments will come in small, medium and large to fit Shuttle crewpersons of all sizes and genders.

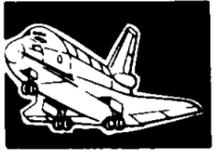


EAGER FOR FLIGHT — Space Shuttle Orbiter 101 was briefly visible June 26 as the forest of workstands and catwalks was pulled back at the completion of final assembly and proof test at Rockwell International's Palmdale Orbiter assembly plant.

ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS



VOL. 15 NO. 14

Friday, July 16, 1976

NASA Issues Recruiting Call for Shuttle Pilots, Mission Specialists

NASA issued a call last week for Space Shuttle astronaut candidates. Applications will be accepted until June 30, 1977, and all applicants will be informed of selection by December 1977.

At least 15 pilot candidates and 15 mission specialist candidates will be selected to report to JSC on July 1, 1978, for two years of training and evaluation. Final selection as an astronaut will depend on satisfactory completion of the evaluation period.

NASA is committed to an affirmative action program with a goal of having qualified minorities and women among the newly selected astronaut candidates. There-

fore, minority and women candidates are encouraged to apply.

Pilot applicants must have a bachelor's degree from an accredited institution in engineering, physical science or mathematics or have completed all requirements for a degree by Dec. 31, 1977. An advanced degree or equivalent experience is desired. They must have at least 1,000 hours first pilot time, with 2,000 or more desirable. High performance jet aircraft and flight test experience is highly desirable. They must pass a NASA Class 1 space flight physical. Height between 64 and 76 inches is desired.

Applicants for mission specialist candidate positions are not required to be pilots. Educational qualifications are the same as for pilot applicants except that biological science degrees are included. Mission specialist applicants must be able to pass a NASA Class 2 space flight physical. Height between 60 and 76 inches is desired.

Pay for civilian candidates will be based on the Federal Government's General Schedule pay scale from grades GS-7 through GS-15, with approximate salaries from \$11,000 to \$34,000 per year. Candidates will be compensated based on individual academic achievements and experience. Other benefits include vacation and sick leave and participation in the Federal Government retirement, group health and life insurance plans.

Civilian applicants may obtain a packet of application material from JSC. Requests should be mailed to either Astronaut (Mission Specialist) Candidate Program or Astronaut (Pilot) Candidate Program, Code AHX, NASA Johnson Space Center, Houston, Texas 77058.

Military personnel should apply through their respective military

departments using procedures which will be disseminated later this year by DOD. Military candidates will be assigned to JSC but will remain in active military status for pay, benefits, leave and other military matters.

Currently, 31 persons are available as Space Shuttle crewmen, including nine scientists. Twenty-eight of them are astronauts assigned to JSC and three hold government positions in Washington, D.C.

The Space Shuttle is a reusable vehicle that will replace virtually all of this nation's space launch vehicles. Shuttle missions could include deploying and retrieving satellites, servicing satellites in orbit, operating laboratories for astronomy, Earth sciences, space processing and manufacturing, and developing and servicing a permanent space station.

Launched like a rocket, the Shuttle will perform Earth orbital missions of up to 30 days, then land like an airplane and be refurbished for another mission. Pilot astronauts will control the Shuttle during launch, orbital maneuvers and landings and be responsible for maintaining vehicle systems. Mission specialist astronauts will be responsible for the coordination of overall orbiter operations in the areas of flight planning, consumables usage and other activities affecting payload operations. At the discretion of the payload sponsor, the mission specialist may assist in the management of payload operations, and may, in specific cases, serve as the payload specialist. They will be able to continue in their chosen fields of research and to propose, develop and conduct experiments.

(Continued on page 3)



LONG IN SERVICE — JSC Director Christopher C. Kraft, Jr. recently presented Length of Service Awards to 24 JSC employees. In photo gallery at left, starting with top row, employees with 35 years service are Joe Harris, Dock J. Hudson, Jack A. Kinzler, John W. McKee, William J. Nunnery and Lewis H. Williams. (Not available for photo: Jack A. Jones.) Receiving 30-year service awards were Earnest Boyd, Leo T. Chauvin, James E. Correale, Walter T. Danley, Jr., Hazel W. Hoffpaur, Owen G. Morris and Wiley W. Murrell, Jr. Logging 25 years' service were Charles L. Bailey, Doris S. Kreske, Audrey V. Lemons, Madeline B. Messenger, Gene C. Parker, John R. Sevier, Jr., Deane J. Schwartz, Richard F. Smith, James B. Trout, Charles F. Wasson and James H. Willis.

EAA Survey Shows Club Interests Vary

Being an EAA sanctioned club affords that organization benefits not gained by a group who just "gets together." Having the sanction of the JSC EAA Board gains a group the privilege of using JSC's name, the use of the Center's internal mail system, the *Roundup* for advertisement, an assurance of a place to meet — the Gilruth Recreation Center, and, in some instances, the use of Center equipment. These are only a few of the benefits derived by being an EAA sanctioned club.

A new addition to our club roster is the "New Trails Club." In response to a number of survey inquiries, "What is the New Trails Club?" here is your answer. Reading from the Club By-Laws: "The purpose of the club shall be to

promote true understanding of all Native American cultures. The scope of this club shall embrace the study of the Tribal lore, culinary habits and cultural achievements of all Native Americans, both in the past and at present." To achieve this goal, related books will be purchased and placed in the JSC Technical Library for the use of all employees. This group also participates in community activities to further accomplish their goals for the benefit of all citizens.

Interest was shown in a number of clubs but membership is small. If you expressed an interest in a club or clubs, call the listed contact. They are all anxiously awaiting new members. The club roster is listed *(Continued on page 3)*

CLUBS

The following clubs are currently sanctioned by the EAA. Please indicate your participation/interest.

CLUB	CONTACT	EXT & CODE
Aero Club	Jackie Bohannon	4161, ED83
Amateur Radio Club	Ron Simantel	3981, FE2
Arts & Crafts Club	Joyce Priode	5469, JF3
Astronomy Club	Richard Rogan	5482, FD7
Barbershop Quartet	Bill Drewes	4386, CB
Computer Hobbyist Club	Marlowe Cassetti	3563, FR5
JSC Cultural Club (Travel Club)	Jerry Lowe	5321, PF
JSC Dance Club	Edi Quinn	3431, EW5
JSC Golf Club	Jerry Shinkle	2588, CG3
Judo Club	Arland Actkinson	3043, FM8
Karate Club	Lynn York	3821, MC2
Ladies Slimnastics	Billie Gibson	5233, WA
Lunarfins	Jim Peacock	2208, LT
New Trails (amer. Indian Cultures)	Joe Doke	2091, LC
Photography Club	Dave Heath	5954, FM4
Radio Control Airplane	Paul Jaschke	2557, PH
JSC Stamp Club	Russell Clickner	4549, WT2
Table Tennis Club	Stephen Jacobs	3561, ES5
Tennis Club	Bob Voss	2741, BP

CLUB	MEMBER	INTERESTED	NOT INTERESTED
Aero	7	96	628
Amateur Radio	21	85	650
Arts & Crafts	10	194	578
Astronomy	4	113	624
Barbershop Quartet	-	24	709
Computer Hobbyist	4	68	681
JSC Cultural Club (Travel Club)	93	230	478
JSC Dance	23	121	624
JSC Golf	31	122	603
Judo	2	69	676
Karate	5	83	661
Ladies Slimnastics	8	110	642
Lunarfins	28	72	648
Photography	7	185	591
Radio Control Airplane	7	80	668
JSC Stamp	15	53	645
Table Tennis	5	102	646
Tennis	64	219	533
New Trails	3	92	613

The Following clubs can be organized if sufficient interest is indicated.

	INTERESTED	WOULD JOIN	NOT INTERESTED
Music	78	15	632
Square Dance	98	32	621
Great Books	99	29	619
Sports Car	52	17	643
Motorcycle	44	19	649
Bicycle	98	34	595
Language	132	37	587
Singletons	31	20	649
Charm	40	13	650
Motion Picture	82	23	632
Little Theatre	63	19	625
Other			

EAA ATTRACTIONS

DANCE CLUB

The JSC Dance Club recently elected the following new officers: president Sam Palazzola, vice president Caroll Dawson and secretary-treasurer Elaine/Bill Simon.

Dance classes are held each Wednesday night at the Gilruth Recreation Center. New classes start August 4 and run 10 weeks at a cost of \$37/couple. Introductory, intermediate, high intermediate and advanced classes are offered with instruction by Bob and Rae Calvert. All JSC federal and onsite industry employees are eligible to join.

For additional information call Elaine Simon at 333-3508 or Bill Simon at 483-4027.

KICK-SMOKING CLASS REPEATS

Success of the first 5-Day Plan to Stop Smoking and the enthusiasm of survivors has generated a demand for another course which will run October 4-8 (Mon-Fri) at the Gilruth Recreation Center 7-9 pm. The cost again will be \$7.50/person.

Doubters should talk to someone taking the first course, then call ext 2130 and leave name, extension and mail code.

SAFETY ITEMS

Sale of safety devices advertised in the June 18 Roundup and the EAA Beacon ends next Friday, July 23. Prices for the top-quality detectors and fire extinguishers are excellent, and everyone should have at least one of each in his home. Info and spec sheets are posted on bulletin boards or are available at the Bldg 11 Exchange Store, where orders are taken.

ALLEY THEATRE

The Alley Theatre Corporate Subscription program is once again being offered to all NASA and industry employees. Under this program season tickets are offered for next year's five performances at a low price of \$19.95.

See your EAA representative for an Alley Theatre brochure which will explain the program to those of you who are not already familiar with it. The brochure also contains an order form for your subscriptions. If you are planning to attend the Alley next year, fill out the order form, enclose a check payable to Alley Theatre or indicate a charge plan on the form, and send to Patty Holmes, EG3 (X-3066).

Your Corporate Subscription coupon books will be mailed to you just prior to the opening of the 76-77 season in October. The deadline for placing orders under this special program is August 15, so don't delay in getting your orders in the mail.

TENNIS

The next set of lessons will start on July 26. Sign-up now. Group lessons are \$30.00 (8 hrs.) and individual lessons start from \$30.00. For information please call x3594.

Sign up now for the next softball and volleyball seasons. Mens and Ladies volleyball starts the week of August 2. Softball will start the week of August 16.

Schedules of Recreation Center activities are posted in the gym, Bldg. 3 & Bldg. 11. Call x3594 for specific questions.

LEAGUE SPORTS STANDINGS:

MENS A LEAGUE			
Team	W	L	Pct.
Blazers	3	1	.750
Dreamers	3	1	.750
Mets	3	1	.750
Bandits	2	2	.500
Dynamos	2	2	.500
Nads	2	2	.500
Sopac	1	3	.250
Dudes	0	4	.000

MENS B LEAGUE			
Monday Division			
Team	W	L	Pct.
Fokkers	2	1	.666
Oreos	2	1	.666
Hustlers	1	2	.333
Singer	1	2	.333

Wednesday Division			
Team	W	L	Pct.
Animals	3	1	.750
Marvels	3	2	.600
Nerds	3	2	.600
Rats	2	2	.500
Turkeys	0	4	.000

Thursday Division

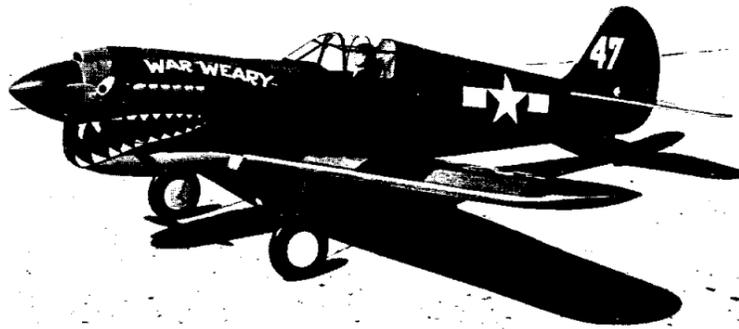
Team	W	L	Pct.
Dreamers	3	0	1000
Green Demons	2	1	.666
McDonnell Douglas	1	2	.333
Red Fokkers	0	3	.000

MENS C LEAGUE

Team	W	L	Pct.
Boas	3	1	.750
Heat	3	1	.750
SMD	3	1	.750
Mx Bros.	2	2	.500
Moon Pies	2	2	.500
TIA Oldtimers	2	2	.500
Oreos	1	3	.250
Rookies	0	4	.000

WOMENS SOFTBALL

Team	W	L	Pct.
Blazers	4	0	1.000
Rookies	2	2	.500
Kentron	2	3	.400
Roadrunners	2	3	.400
WYSIWYG	1	3	.250



OLD WARBIRO - World War II model airplanes, such as this Curtiss-Wright P-40 Warhawk built by Don White of JSC Flight Simulation Division, are expected to compete in Sunday's sport scale event sponsored by the JSC Radio Control Club.

Modellers Hold Two-Day Meet

The JSC Radio Control Club tomorrow and Sunday will sponsor a two-day model airplane contest at the JSC Antenna Test Range west of Bldg 14.

Saturday's program features timed "scrambles" and Las Vegas dice-roll task flights. In the scramble competition, flights are timed for a set of maneuvers including takeoff, three loops, three passes at

a balloon, and landing. The Scramble is from 9 am to 12 noon and Las Vegas from 1 to 4 pm.

Sport Biplane and Sport Scale events are on Sunday's schedule, and the nostalgia-evoking World War II models usually fly in the Sport Scale events.

The sport biplane competition will follow AMA rules except for no scale bonus and all entrants will fly the Sportsman Class pattern. In Sport Scale, scores will be the average of two flights. More than one airplane may be entered in sport scale, but only the best score will count for trophies.

Entry fees are \$3 for Scramble and Las Vegas events, and \$5 for Sport Biplane and Sport Scale. All contestants must have current AMA and FCC licenses. Registration is from 8 to 9 am each day.

SCIENCE TEAM

(Continued from page 1)

Have the cold, permanently-shadowed polar regions of the Moon trapped volatiles - particularly water - which might be used as resources to support a lunar base?

Even partial answers to these questions would tell us much about the early history of the Earth, Mars, the other terrestrial planets, and the solar system.

EAA Survey

(Continued from page 2)

below with a club contact, extension and mail code.

New clubs can still be accommodated. Great interest was shown in forming a Language club, square dance and several more. If you are truly interested, contact the Vice President of Organized Clubs, Geraldine Taylor, BA/x4303, and she will be happy to give you information and assistance in forming an EAA sanctioned club.

Recruiting

(Continued from page 1)

Crews could consist of as many as seven people - commander, pilot, mission specialist and up to four payload specialists, who need not be NASA employees and who will be nominated by the sponsors of the payload being flown. Payload specialists will operate specific payload equipment where their special skills are needed.

Potential users of the Space Shuttle include government agencies and private industries from the United States and abroad.

Roundup Swap-Shop

Swap Shop advertising is open to JSC federal and on-site contractor employees. Goods or services must be offered as advertised, without regard to race, religion, sex or national origin. Non-commercial personal ads should be 20 words or less, and include home telephone number. Typed or scribbled ad copy must be received by AP3/Roundup by Thursday of the week prior to publication.

VEHICLES

72 Honda CB350, Wixom fairing, lug box, less than 7K miles, \$550, helmet \$10. Ealick, 474-3328.

74 Gremlin, air, pwr steer, tape w/spkrs, \$2400. Rose Mary, 925-2188.

74 Duster, air, pwr, auto, vinyl roof, radio, fld-dwn rear seat. 333-4606.

75 tractor-type riding mower, 8-hp BS, 34-in floating head w/twin blades, elec start, lites, 30 hrs run time, pneumatic tires, \$450. Alexander, 482-0920.

69 Plym Barracuda, 318 V8, auto, air, clean, great for schoolkids, \$1200. 472-7478.

73 Vega Fastback, 25K miles, new Bicentennial paint, auto, air, xint int, \$2100. 332-6122 or 534-2476.

26-in boy's bike, good cond, \$20. 333-2509.

74 Duster, gold, pwr, auto, fld-dwn rear seat. 333-4606.

74 Triumph 750, mint cond, rebored, adult owner, lugrack, backrest, highway pegs, \$1395 or make offer. Annexstad, 534-4338.

20-in 3-spd Schwinn boy's bike, \$20; ladies' 3-spd bike, \$30; saddle-bag type bike basket, \$8. 944-4687.

71 Ford Ranch Wagon, air, pwr. 473-0897.

75 Chevy Luv truck w/cust camper-top, loaded, red, low miles, 26 pmts @ \$149/mo. Burgan, 944-7828 after 6.

51 Chevy Deluxe, 63000 orig miles, runs great, body & int great, make offer. Bill, 645-6883.

74 Buick Century 2-dr, air, pwr, AM/FM/tape, vinyl top, tilt wheel, split bench, immaculate. McCarthey, 744-9508.

Rent motorhome \$125/wk plus 6 cents/mile (incl ins), also daily rates. 471-5161.

Rent Coleman w/sink, stove, cabinets, dinette, slps 6. 488-2387.

72 Yamaha 350 streetbike, 6K miles, \$425. 944-3656.

Honda CL-70 streetbike, good cond. \$150. White, 554-2916.

74 Kawasaki 90 MC1 minibike, super tricked, new chain, two exhausts, xint cond, ready to ride, son has outgrown, make offer. 944-6513.

73 Honda XR75K1, stock, never raced, kids uninterested, \$275; 75 Yamaha YZ80B, less than 10 hrs, race hndlbrs/grips, 26mm Naguchi carb and reed valve, Boge shocks, never raced, \$400; 75 3-bike Thomas trailer, floored, big wheels, spare, like new, \$200. Doug, 538-2367.

BOATS

73 Spyder 16-ft trihull, 6 lounge seats, walk-thru wndshid, 45-hp Chrysler, trlr, xint cond, \$1875. 482-7029.

PROPERTY & RENTALS

Galveston Spanish Grant lot w/great Gulf view. Parker, 440-6147.

20 acres beautifully wooded, Cleveland-Livingston area, will sell 10 or 20 acres. Parker, 440-6147.

Lease 3-2-2 Spanish in CLC, fenced, 1450 sq ft, \$350/mo, 1st and last mo plus \$100 security deposit. 474-2081 or 334-2187.

4-2-2 CLC Oakbrook West for lease, 2200 sq ft, fireplace, fenced patio, lrg pntd living rm, 5 yrs old, \$450/mo, no pets. 488-6796 after 6.

Camping lot for sale or rent in Texas Campgrounds, Conroe, private, protected, leave camper, swimming pool, \$800. 488-2652.

1.75 acre lot off Sunset on Richmond Lane-Friendswood for miniranch, many small trees, \$11,500. 482-3011.

New hunting lease forming on 4600 acres NW of Uvalde, 15-gun limit, all prime and trophy game in season, no phone calls, no reservations - gun is reserved all season, \$300/gun. Bill, 479-1375 after 5:30.

Caribbean beachfront lot, white sand and coconut trees, diving and fishing paradise, Belize, British Honduras. 356-1188.

Two bedroom apartment, By-The-Sea Condominium. West Beach, Galveston, fully equipped and furnished, few summer weeks left for unusually low price of \$260 per week for firm reservation, Clements 474-2622.

Rent delightful Bay Area waterfront furn apt to mature or retired individual, 10 min to JSC, 300 yds to boatramp, \$135 incl utils. 641-0143.

HOUSEHOLD ARTICLES

Zenith 17-in color TV, \$225. Carolyn, 334-1761.

Child sitting nites or weekends, resp adult and teenager. Marge Holmes, 482-2060.

Sennheiser HD-414 stereo headphone w/25-ft coiled xtn cord, \$25. Lake, 523-2137.

Vinyl sofa, good for camp use. 488-8675.

Antique solid-mahogany upright piano, full size, just rebuilt, \$185, Bilis, 334-5652 after 5.

Upright piano, good cond, plays good, ideal for beginner, \$150. McCaulley, 471-3298.

Lawn mower, \$40; Elna swng mch, \$85; wood desk, \$25; gun cab, wood/glass doors, \$30; mahog bookcase \$8; guitar; \$20; 10x13 tent, \$75; 3 cots, \$3/ea; 7 sleeping bags, \$2/ea; Hollywood bed frames, 3 @ \$8/ea; belt massager, \$45. Bernhard, 488-0549.

Quad stereo w/4 spkrs, quad 8-trk, AM/FM tuner, aux 4-2 chan & phono inputs, good cond, w/tapehead demag. Joe, ext 3791 (no home phone) 800 NASA Rd 1, Apt 289.

Single-bed boxsprings incl legs, \$10 or best offer. Tilton, 488-2511 evngs.

Coppertone elec range, 54-in wide, good cond, \$65. 474-4363.

Child' carseat, \$10; highchair, \$8; baby walker, \$2; crib mattress, \$5; hobbyhorse, \$6; portacrib w/mesh sides, needs repair, \$2. Godeke, 332-6063 evngs.

PETS

AKC-reg wirehair fox terrier puppies, one each M/F, \$90/ea. 482-0553.

2-yr old black, grey and white Lhaso Apso Underhill's Tibetan Dustmop at stud for fee only, first litter sired produced 6 pups. 482-3100 after 5.

Free 6-wk old kittens, two orange, one white. Schultz, 334-3046.

AKC-reg Samoyed 5-yr old male, friendly, lovable, beautiful pure white. 333-3402.

AKC male Sheltie 4-yrs old, beautiful sable, housebroken, Ch-sired, \$150. 356-1188.

Tropical fish: six tin-foil barbs, full grown (7-9 in) need bigger aquarium, make offer. Tim or Patty, 334-1455.

AKC Brittany Spaniel puppies, white and orange, \$75. Carol, 474-4831 evngs.

WANTED

Carpooler from Belfort/Broadway/Gulf Fwy to JSC 8-4:30. Bill, 5437.

Refrigerator in good running cond, pay up to \$100 depend on age, size and cond. Merrifield, 333-2437.

Ride from near Sears-Pasadena 7:30-4. Williams, 483-5830 or 477-2622.

Single or bunk beds, dresser and small table w/chairs, for budding Aggie-must be reasonable. 946-5849 after 5.

WANTED - RIDE

Wish to share a ride from the Spring Branch area to the Center. Maurice Bartel, 9595 Westview, tele. 461-4979 or office extension 6267.

MISCELLANEOUS

Fresh, natural honey by Friendswood bees, \$2.50/qt. Beekeeper Statz, ext 4039.

Silver and sterling silver jewelry, xint cond, 80 pieces \$7-\$10 each. 747-3977.

Corvette-type/size trunk-mtd lug rack, new, \$43 value, \$25. Marchal, 534-3021 after 5.

Deep-sea fishing for 1-5 people, equip and bait furn, \$150 for reservations. 534-2390.

Two 20-gal polyethylene tanks for pickup, compl inst w/3-way valve, hoses, mount straps, hdwe, \$60. 333-3446 evngs.

Sears best hand mimeograph, like new, good supply paper/ink, \$215 value for \$135 McCullough, 422-4849.

36,000-BTU central heating/cooling syst, compl, has cracked heat xchangr, \$200. Bell, 334-3227.

3.5-hp Briggs & Stratton lawnmower engine, good cond, easy start, \$20. Samouce, ext 2581.

Bay Area Singles Club get-acquainted dance 8 pm tonight (July 16) at Chateau Dijon party room on Buccaneer Lane near Reseda, CLC. Ray or Jim at ext 2815 for info.

Two H78-14 WSW tires, plenty tread, both \$25. Brown, 471-0066.

Two Sears Dynaglas belted 28 BSW G78-14 tires, perf cond, less than 50 miles, comb cost new \$92, asking \$60. Williams, ext 3538.

Garage sale July 16 from 10 families, baby items, toys, furn, paintings, TV, clothes, 15526 Edenvale, Wedgewood Village. Ferguson, 482-3241.

LOST

Chrome Cross pen, somewhat worn finish, nick at tip. Bob Sampson, ext 5131.

Earth's coldest spot hotter than Mars' hottest

By Carl Sagan
Director,
Laboratory for Planetary Studies,
Cornell University

The planet Mars is very cold. Its atmosphere is very thin. In the tropics the temperature drops by more than 80 Celsius (150 Fahrenheit) degrees every night. The coldest temperatures ever recorded anywhere on Earth in the last few thousand years are higher than average mid-latitude Martian temperatures. At the poles the temperatures are low enough for carbon dioxide to freeze out from the sparse polar air, and the polar caps are at least in part immense deposits of dry ice.

Spectroscopic analysis of sunlight reflected off Mars shows the presence of tiny quantities of water vapor in its atmosphere and immense quantities of water chemically bound up in the surface rocks. There are probably large amounts of water ice in the polar caps and vast quantities frozen subsurface at lower latitudes as permafrost.

Thus there is water vapor and water ice and chemically combined water but—except for small amounts in tiny pores in the Martian soil—there can be no liquid water on Mars today.

The reason is very simple. For a material to remain liquid it must satisfy two conditions. First, its temperature must be between its freezing point and its boiling point. Equatorial daytime conditions on Mars satisfy this condition for liquid water. But in addition there must be enough atmospheric pressure to keep the material liquid. A liquid exposed to a vacuum will evaporate very rapidly. Molecules would meet no impediment when escaping from its surface and soon the liquid will have evaporated away. There is so little atmosphere on Mars that the boiling point is very close to the freezing point and in any case evaporation will occur very rapidly. Open pools of pure liquid water, flowing rivers of water, cannot exist on Mars today.

And yet there seems to be evidence of running water on Mars. One of the most astonishing findings of the United States' Mariner 9 mission to Mars was that the planet is covered with thousands of sinuous tributated channels. The largest are 100 to more than 1,000 kilometers (60 to more than 600 miles) long; have tight meanders; tributaries running in the correct direction downstream; teardrop shaped islands, correctly oriented with the sharp point downstream; and with complex braided patterns of silt. The smallest ones—vastly more numerous—are only a few miles long with vague sinuosities and few tributaries.

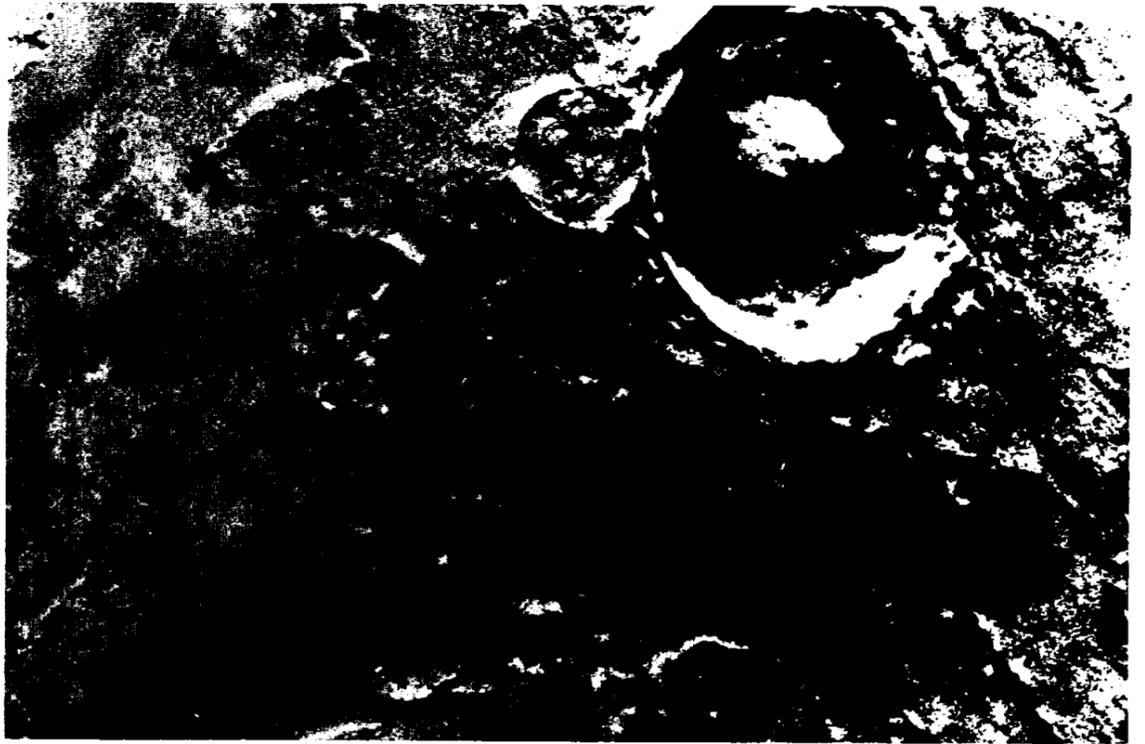
The channels of Mars correspond neither in position nor in form to

the "canals" which we now know to be due to errors of human perception in pre-spacecraft times. Some of the smaller channels may be valleys not produced by running water. Some of the larger channels—particularly those which begin in a jumbled chaotic terrain—may be produced by breakout flooding of ice-dammed subsurface water. Many of the channels seem to be produced by rainfall. No alternative liquid besides running water has been proposed which is reasonable for the physical conditions of Mars. We thus are faced with an apparent paradox: The environment of Mars does not permit running water; and yet the surface of Mars is covered with signs of running water.

But how old are the channels? The only tool for dating them which we have at present—and it is a poor tool—is counting the number of impact craters in and around the channels. We can estimate the population of impacting debris on Mars through its history: The higher the number of impact craters the longer the channel must have been around to accumulate them. In this way it has been determined that some of the larger channels are hundreds of millions of years old. Others may be, for all we know, much older or much younger.

A solution to the paradox then becomes evident: The climate of

MARTIAN RIVERBEDS?—A mosaic of five photo frames sent back by Viking I from an altitude of 990 miles above the Martian surface show braided channels that once held flowing water. Fine grooves and hollows on the upstream side of flow obstacles are also visible.



LUMPY TERRAIN—Rugged features like crater Yuty and surrounding debris flow near Viking 1's original July 4 landing site have caused project officials to delay landing three times. At Roundup press time, a fourth candidate landing site was being surveyed through photos relayed back Tuesday from the orbiting Viking.

Mars varies. Today Mars is plunged into deep ice age conditions. But at least once and possibly many times in its past it has experienced higher pressures, balmer temperatures and abundant running liquid water. There are many interesting implications of this idea. If Mars can undergo such enormous climatic variations can this shed any light on the climatic variation which the Earth has experienced? Two million years ago the site of present-day Chicago was under glaciers several miles high. Does the Martian experience provide us with some cautionary reminders about how not to change the environment of the Earth? And also there is the question of life. Do those more clement early conditions suggested by the channels mean that Mars once had an environment entirely suitable for life? Could there be life on Mars today evolved from those more clement conditions and awaiting the end of the long winter?

Before these questions are addressed we must be sure that the channels were in fact carved by liquid water and that the climate of

Mars is in fact variable. We need more information. There is no trouble in hiding a dense earlier atmosphere on Mars today. The enormous thickness of the polar caps correspond to a very thick atmosphere. According to one estimate, if the polar cap were vaporized it would correspond to an atmospheric pressure over the whole planet as thick as that on Earth today. But we do not know very well the age of the various polar deposits. Crater counts by the high resolution cameras on the Viking orbiter next summer could help resolve this issue.

The present plan is to set the first Viking lander down July 20 to the west of a region called Chryse.

But Viking will perform another and in a way a much more interesting test. If in its remote past Mars had a much denser atmosphere, where could that atmosphere be today? I have already mentioned that it could be frozen away in the polar caps if the polar temperatures are below the freezing point of the atmosphere. Or it could have chemically combined with the surface of Mars if that early atmosphere underwent such chemical reactions. Or it might have all escaped to space from the top of the Martian atmosphere, if it were composed of sufficiently light gases.

Now there is one particular gas which will do none of these things. It is called argon. Its freezing point is far below the coldest temperatures on Mars. It is a so-called noble gas which does not engage in any chemical reactions of note whatever.

And it is so heavy that it could not possibly have escaped from Mars. If in its early history the gurglings and rumblings of the Martian interior outgassed a great atmosphere, many of the constituents may have been lost by one or another of these mechanisms. But not argon. If there was once a dense atmosphere, argon should be present in the Martian atmosphere still. (On Earth it comprises about one percent of our atmosphere for just these reasons.)

In 1973 the Soviet Union made an unsuccessful attempt to land a Viking-class spacecraft on the surface of Mars, a spacecraft called

Mars 6. It mysteriously failed within one second of landing. Among its instruments was a device called a mass spectrometer, designed to analyze the composition of the Martian atmosphere after landfall. On the way down to the surface, the mass spectrometer was busy scrubbing itself clean of residual gases leaking in from the Martian atmosphere during descent.

The pressure in the device was monitored. To the surprise of the Soviet investigators the scrubbing mechanism worked very poorly and a high residual pressure remained.

Now this might be caused by a malfunction such as a leak, but it would have to be a very special sort of leak. The alternative is that the Martian atmosphere contained unexpectedly large amounts of a gas immune to the scrubbing. The most likely such gas turns out to be argon. The Soviet investigators have concluded that the present Martian atmosphere comprises 35 percent argon with an uncertainty of about 15 percent. The remainder of the atmosphere is almost exclusively carbon dioxide.

This is precisely the result we would expect if Mars had a very dense early atmosphere. But the Mars 6 measurement is indirect and has an alternative explanation. Three instruments onboard Viking, two of them mass spectrometers, will be capable of checking the argon abundance. If Viking works well we should have clear-cut evidence on the argon abundance and the past history of Martian climate.

We seem to be on the verge of being able to compare the past climatic histories of other planets with our own. In a few months we may be able to check out the tantalizing idea than in an earlier epoch in Martian history, the sky was blue and not black, the winds were mild, the air was thick, the temperatures relatively balmy and the gurgle of streams and the mighty roar of cascading rivers could be heard abundantly on the surface of the Red Planet. And if in the past, why not in the future? Might we be able at some future time to prod Mars into returning to its pleasant past environment and—if there is no indigenous life—hosting immigrants from the distant planet Earth?